

**REMARKS**

Claims 1-15 are now pending in this application. Claims 1-13 are rejected. New claims 14 and 15 are added. Claims 1-13 are amended herein to clarify the invention, to express the invention in alternative wording and to address matters of form unrelated to substantive patentability issues.

Applicants herein traverse and respectfully request reconsideration of the rejection of the claims cited in the above-referenced Office Action.

Claims 1-13 are rejected as indefinite under 35 U.S.C. § 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter of the invention as a result of informalities stated in the Office Action. The claims are amended to remove or correct the informalities noted in the Office Action. In particular, rather than recite the phosphor as a “fluorescence-type phosphor,” the claim is revised to recite a “phosphor of a type exhibiting fluorescence.” Furthermore, the phosphor of this claimed type is no longer presented in the preamble, but rather is included as a positively recited element, such that it must be fully accorded patentable weight.

Applicants respectfully submit that such characterization of the fluorescent properties of the claimed phosphor is fully consistent with known distinctions in properties of phosphors in general. In this regard, and contrary to the Examiner’s allegations, applicants note that a “phosphor” need not exhibit “some degree of phosphorescence” as averred by the Examiner at page 3 of the Advisory Action

dated June 22, 2010). Rather, a phosphor is defined simply as “a substance that exhibits the phenomenon of luminescence.” (See printout of Web page from Wikipedia, (<http://en.wikipedia.org>) included herewith for the Examiner’s edification). As explained therein, “luminescence” is a generic term which is divided into two mutually exclusive species, these including phosphorescent materials (i.e., materials showing a relatively slow decay in brightness after excitation) and fluorescent materials (i.e., materials which have an almost instantaneous emission decay). Thus, it is clear that the Examiner’s statement that “[t]he use of the term ‘phosphor’ implies that the material exhibits phosphorescence” (see page 3 of the Advisory Action mailed June 22, 2010) is without merit and is clearly contrary to accepted principles relating to the two separate and distinct types of phosphors known to those skilled in the art, i.e., fluorescent and phosphorescent. The present invention, which describes a phosphor suitable for use in PDPs, can only be a phosphor of the type selected from the second category of phosphors, which is a fluorescent material exhibiting fluorescence rather than phosphorescence.

Therefore, based upon the foregoing, reconsideration of the rejection of claims 1-13 as being indefinite and their allowance are earnestly requested.

Claims 1, 4-7, and 9 are rejected under 35 U.S.C. § 103(a) as obvious over Oshio et al. (US 6,096,243) in view of Morihito et al. (JP 2000-144129). The applicants herein respectfully traverse this rejection. For a rejection under 35

U.S.C. §103(a) to be sustained, the differences between the features of the combined references and the present invention must be obvious to one skilled in the art.

Claim 1 is directed to a fluorescent material which comprises “an alkaline earth metal aluminate phosphor of a type exhibiting fluorescence.” Since the Examiner indicates his understanding of the significance of the phenomenon of fluorescence, applicants will not discuss this characteristic at great length. Applicants do, however, respectfully submit that a type of phosphor which exhibits fluorescence is quite different chemically (structurally) from one that exhibits, instead, phosphorescence, and has very different functional characteristics and applications, as explained above. Since the present invention is directed to a fluorescent material suitable for use, for example, in PDPs, it is essential that afterglow be substantially absent, lest a display of a moving image be adversely effected by “ghost” images caused by a retention of image for greater than a few milliseconds.

Applicants respectfully submit that the proffered combination of references fails to make obvious the present invention for at least two reasons described below.

Firstly, one of ordinary skill in the art seeking to modify a fluorescent material, with its unique composition, would not have had the requisite reasonable expectation for success that an activator or similar material that worked with the

class of phosphors disclosed by Morihito et al., functioning as a phosphorescent material, would achieve the desired improvement of the present invention, *inter alia*, good heat resistance and durability against vacuum ultraviolet rays and ultraviolet rays in a phosphor suitable for use in a PDP, since the luminance producing mechanisms of phosphorescence versus fluorescence are dissimilar in nature. As such, one skilled in the art could not reasonably predict the effect of an additive used in the former type material as applied to the latter, presently claimed type of material.

Secondly, as clearly depicted in the comparison graph in Fig. 2 of the Morihito et al reference (a translated copy of which is provided herewith), wherein the dotted curve is a commercialized product (conventional art) and the solid curve is the product according to Morihito et al., with afterglow luminance being plotted against afterglow time, it is abundantly apparent that the addition of an activator and coactivator in the phosphor of Morihito et al., as taught therein, enhances afterglow (i.e. increases the length of afterglow) by 200 minutes or longer beyond that ordinarily present in unmodified conventional phosphors mentioned in Morihito et al.. This added afterglow, while advantageous for phosphorescence-type phosphors which are usually employed in, e.g., clockfaces, lights, guide signs, and the like, is quite undesirable and unacceptable in phosphors of the type being presently claimed which exhibit, instead, fluorescence. Such enhancement of afterglow would be disastrous in applications

such as PDPs, because lengthened afterglow time would lead to very poor imaging properties.

In conformance with the above discussed graph, Morihito et al. recites: “Addition of an activator and a coactivator to the above base material dramatically enhances afterglow and luminance” (see paragraph [0010] in JP 2000-144129). Thus, one skilled in the art reading Morihito et al. would, if anything, expect that the addition of the ‘coactivator’, which can be Nb, would operate to significantly enhance afterglow and luminance. This would be quite undesirable, and would lead one away from applying the teachings of Morihito et al. in an application directed to the claimed fluorescent material suitable for use in PDPs, where very brief or no afterglow is sought. Consideration must properly be given to teachings of the prior art which would lead one away from the claimed invention as well as those that might suggest the invention. *Mendenhall v. Astec Industries, Inc.*, 13 USPQ2d 1913, 1939 (Tenn 1988), *aff’d*, 13 USPQ2d 1956 (Fed. Cir. 1989).

Thus, it is respectfully submitted that the rejected claims are not obvious in view of the cited references for the reasons stated above. Reconsideration of the rejections of claims 1, 4-7, and 9 and their allowance are respectfully requested.

Claims 2, 3, 8, and 10-13 are rejected under 35 U.S.C. § 103(a) as obvious over Oshio in view of Morihito, and further in view of Bouchard et al. (US 3,753,759). The applicants herein respectfully traverse this rejection.

Bouchard et al., cited for its alleged teachings directed to drying phosphors

rinsed with deionized water in heated air, fails to adequately supplement the teachings absent from both Oshio and Morihito, as discussed above. Therefore, the proffered combination of references fails to teach or suggest all claimed features, as is properly required to establish a *prima facie* case of obviousness.

Thus, it is respectfully submitted that the rejected claims are not obvious in view of the cited references for the reasons stated above. Reconsideration of the rejections of claims 2, 3, 8, and 10-13 and their allowance are respectfully requested.

Claims 14 and 15 are added and are submitted as patentable over the cited art of record. Independent claim 15 recites subject matter directed to an alkaline earth metal aluminate phosphor being of a type exhibiting fluorescence comprising bivalent europium as an activator, barium and/or strontium, magnesium, aluminum and at least one element (e) selected from the group consisting of indium, tungsten, niobium, bismuth, molybdenum, tantalum, thallium and lead, and having a content of the at least one element (e) being within a range of 0.0001 to 0.01 mole per mole of said aluminum and a specified formula which, among other features recited therein, is not believed disclosed in the cited art in the manner as claimed. Dependent claim 14 is patentable based on the subject matter recited therein in addition to the subject matter of claim 1.

Two (2) claims in excess of twenty are added. Please charge the fee of \$104 for the extension of time to Deposit Account No. 10-1250.

Applicants file herewith a Request for Continued Examination, in which is included, a request for a four (4) month extension of time for responding to the Office Action.

The USPTO is hereby authorized to charge any fee(s) or fee(s) deficiency or credit any excess payment to Deposit Account No. 10-1250.

In light of the foregoing, the application is now believed to be in proper form for allowance of all claims and notice to that effect is earnestly solicited.

Respectfully submitted,  
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enc: Form PTO-2038; printout from Wikipedia Web page relating to phosphors; and English translated Fig. 2 of Morihito et al.

# Phosphor

From Wikipedia, the free encyclopedia

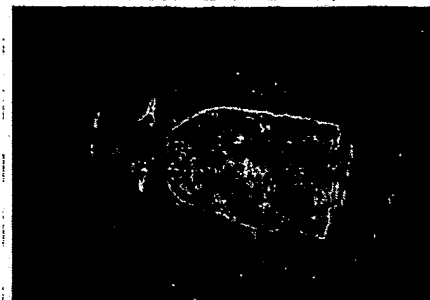
A **phosphor**, most generally, is a substance that exhibits the phenomenon of **luminescence**. Somewhat confusingly, this includes both phosphorescent materials, which show a slow decay in brightness ( $>1$  ms), and fluorescent materials, where the emission decay takes place over tens of nanoseconds. Phosphorescent materials are known for their use in radar screens and glow-in-the-dark toys, whereas fluorescent materials are common in CRT screens, sensors, and white LEDs.

Phosphors are transition metal compounds or rare earth compounds of various types. The most common uses of phosphors are in CRT displays and fluorescent lights. CRT phosphors were standardized beginning around World War II and designated by the letter "P" followed by a number.

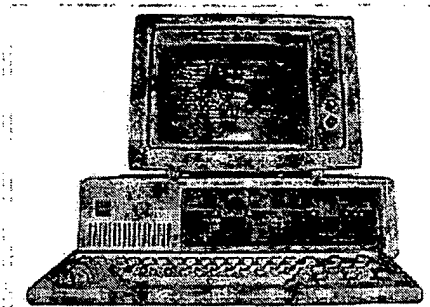
*Note: Phosphorus, the chemical element from which the phenomenon draws its name, can emit light under certain conditions, but this is due to chemiluminescence, not phosphorescence.*<sup>[1]</sup>

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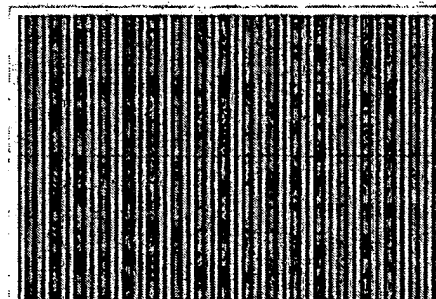
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Example of phosphorescence



Monochrome monitor



Aperture grille CRT phosphors

## Principles

A material can emit light either through incandescence, where all atoms radiate, or by luminescence, where only a small fraction of atoms, called **emission centers** or **luminescence centers**, emit light. In inorganic phosphors, these inhomogeneities in the crystal structure are created usually by addition of a trace amount of dopants, impurities called **activators**. (In rare cases dislocations or other crystal defects can play the role of the impurity.) The wavelength emitted by the emission-center is dependent on the atom itself, and on the surrounding crystal structure.

The scintillation process in inorganic materials is due to the electronic band structure found in the crystals. An incoming particle can excite an electron from the valence band to either the conduction band or the exciton band (located just below the conduction band and separated from the valence band by an energy gap). This leaves an associated hole behind, in the valence band. Impurities create electronic levels in the forbidden gap. The excitons are loosely bound electron-hole pairs which wander through the crystal lattice until they are captured as a whole by impurity centers. The latter then rapidly de-excite by emitting scintillation light (fast component). In case of inorganic scintillators, the activator impurities are typically chosen so that the emitted light is in the visible range or near-UV where photomultipliers are effective. The holes associated with electrons in the conduction band are independent from the latter. Those holes and electrons are captured successively by impurity centers exciting certain metastable states not accessible to the excitons. The delayed de-excitation of those metastable impurity states, slowed down by reliance on the low-probability forbidden mechanism, again results in light emission (slow component).

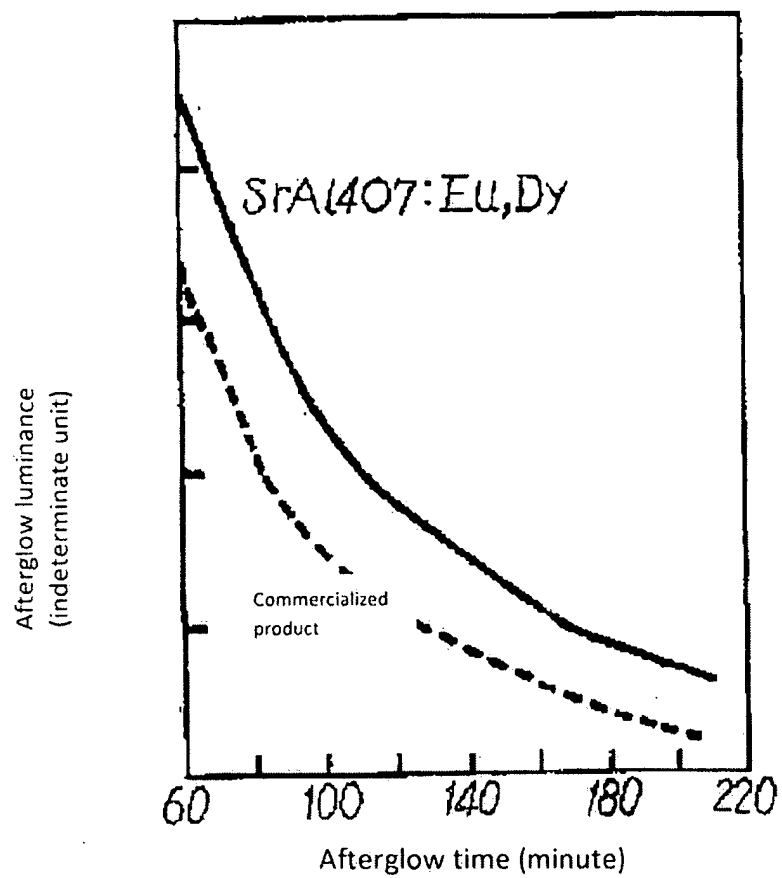


FIG. 2.  
of Morihito et al.